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(a) Perfluoromethane (CF₄), and perfluoroethane (C₂F₆) emissions from anode effects in all prebake and Søderberg electrolysis cells.

(b) CO₂ emissions from anode consumption during electrolysis in all prebake and Søderberg electrolysis cells.

(c) CO₂ emissions from on-site anode baking.

(d) You must report under subpart C of this part (General Stationary Fuel Combustion Sources) the emissions of CO₂, N₂O, and CH₄ emissions from each stationary fuel combustion unit by following the requirements of subpart C.

[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 79155, Dec. 17, 2010]

§ 98.63 Calculating GHG emissions.

(a) The annual value of each PFC compound (CF₄, C₂F₆) shall be esti-

mated from the sum of monthly values using Equation F-1 of this section:

$$E_{PFC} = \sum_{m=1}^{m=12} E_m \quad (\text{Eq. F-1})$$

Where:

E_{PFC} = Annual emissions of each PFC compound from aluminum production (metric tons PFC).

E_m = Emissions of the individual PFC compound from aluminum production for the month "m" (metric tons PFC).

(b) Use Equation F-2 of this section to estimate CF₄ emissions from anode effect duration or Equation F-3 of this section to estimate CF₄ emissions from overvoltage, and use Equation F-4 of this section to estimate C₂F₆ emissions from anode effects from each prebake and Søderberg electrolysis cell.

$$E_{CF4} = S_{CF4} \times AEM \times MP \times 0.001 \quad (\text{Eq. F-2})$$

Where:

E_{CF4} = Monthly CF₄ emissions from aluminum production (metric tons CF₄).

S_{CF4} = The slope coefficient ((kg CF₄/metric ton Al)/(AE-Mins/cell-day)).

AEM = The anode effect minutes per cell-day (AE-Mins/cell-day).

MP = Metal production (metric tons Al), where AEM and MP are calculated monthly.

$$E_{CF4} = EF_{CF4} \times MP \times 0.001 \quad (\text{Eq. F-3})$$

Where:

E_{CF4} = Monthly CF₄ emissions from aluminum production (metric tons CF₄).

EF_{CF4} = The overvoltage emission factor (kg CF₄/metric ton Al).

MP = Metal production (metric tons Al), where MP is calculated monthly.

$$E_{C2F6} = E_{CF4} \times F_{C2F6/CF4} \times 0.001 \quad (\text{Eq. F-4})$$

Where:

E_{C2F6} = Monthly C₂F₆ emissions from aluminum production (metric tons C₂F₆).

E_{CF4} = CF₄ emissions from aluminum production (kg CF₄).

F_{C2F6/CF4} = The weight fraction of C₂F₆/CF₄ (kg C₂F₆/kg CF₄).

0.001 = Conversion factor from kg to metric tons, where E_{CF4} is calculated monthly.

(c) You must calculate and report the annual process CO₂ emissions from anode consumption during electrolysis and anode baking of prebake cells using either the procedures in paragraph (d) of this section, the procedures in paragraphs (e) and (f) of this section, or the procedures in paragraph (g) of this section.

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(d) Calculate and report under this subpart the process CO₂ emissions by operating and maintaining CEMS according to the Tier 4 Calculation Methodology in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(e) Use the following procedures to calculate CO₂ emissions from anode consumption during electrolysis:

(1) For Prebake cells: you must calculate CO₂ emissions from anode consumption using Equation F-5 of this section:

$$E_{CO_2} = NAC \times MP \times ([100 - S_a - Ash_a]/100) \times (44/12) \quad (\text{Eq. F-5})$$

Where:

E_{CO₂} = Annual CO₂ emissions from prebaked anode consumption (metric tons CO₂).

NAC = Net annual prebaked anode consumption per metric ton Al (metric tons C/metric tons Al).

MP = Annual metal production (metric tons Al).

S_a = Sulfur content in baked anode (percent weight).

Ash_a = Ash content in baked anode (percent weight).

44/12 = Ratio of molecular weights, CO₂ to carbon.

(2) For Söderberg cells you must calculate CO₂ emissions using Equation F-6 of this section:

$$E_{CO_2} = (PC \times MP - [CSM \times MP]/1000 - BC/100 \times PC \times MP \times [S_p + Ash_p + H_p]/100 - [100 - BC]/100 \times PC \times MP \times [S_c + Ash_c]/100 - MP \times CD) \times (44/12) \quad (\text{Eq. F-6})$$

Where:

E_{CO₂} = Annual CO₂ emissions from paste consumption (metric ton CO₂).

PC = Annual paste consumption (metric ton/metric ton Al).

MP = Annual metal production (metric ton Al).

CSM = Annual emissions of cyclohexane soluble matter (kg/metric ton Al).

BC = Binder content of paste (percent weight).

S_p = Sulfur content of pitch (percent weight).

Ash_p = Ash content of pitch (percent weight).

H_p = Hydrogen content of pitch (percent weight).

S_c = Sulfur content in calcined coke (percent weight).

Ash_c = Ash content in calcined coke (percent weight).

CD = Carbon in skimmed dust from Söderberg cells (metric ton C/metric ton Al).

44/12 = Ratio of molecular weights, CO₂ to carbon.

(f) Use the following procedures to calculate CO₂ emissions from anode baking of prebake cells:

(1) Use Equation F-7 of this section to calculate emissions from pitch volatiles combustion.

$$E_{CO_2PV} = (GA - H_w - BA - WT) \times (44/12) \quad (\text{Eq. F-7})$$

Where:

E_{CO₂PV} = Annual CO₂ emissions from pitch volatiles combustion (metric tons CO₂).

GA = Initial weight of green anodes (metric tons).

H_w = Annual hydrogen content in green anodes (metric tons).

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BA = Annual baked anode production (metric tons).

WT = Annual waste tar collected (metric tons).

44/12 = Ratio of molecular weights, CO₂ to carbon.

(2) Use Equation F-8 of this section to calculate emissions from bake furnace packing material.

$$E_{\text{CO}_2\text{PC}} = \text{PCC} \times \text{BA} \times \left(\left[100 - S_{\text{pc}} - \text{Ash}_{\text{pc}} \right] / 100 \right) \times (44/12) \quad (\text{Eq. F-8})$$

Where:

$E_{\text{CO}_2\text{PC}}$ = Annual CO₂ emissions from bake furnace packing material (metric tons CO₂).

PCC = Annual packing coke consumption (metric tons/metric ton baked anode).

BA = Annual baked anode production (metric tons).

S_{pc} = Sulfur content in packing coke (percent weight).

Ash_{pc} = Ash content in packing coke (percent weight).

44/12 = Ratio of molecular weights, CO₂ to carbon.

(g) If process CO₂ emissions from anode consumption during electrolysis or anode baking of prebake cells are vented through the same stack as any combustion unit or process equipment that reports CO₂ emissions using a CEMS that complies with the Tier 4 Calculation Methodology in subpart C of this part (General Stationary Fuel Combustion Sources), then the calculation methodology in paragraphs (d) and (e) of this section shall not be used to calculate those process emissions. The owner or operation shall report under this subpart the combined stack emissions according to the Tier 4 Calculation Methodology in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 79155, Dec. 17, 2010]

§ 98.64 Monitoring and QA/QC requirements.

(a) Effective December 31, 2010 for smelters with no prior measurement or effective December 31, 2012, for facilities with historic measurements, the smelter-specific slope coefficients, overvoltage emission factors, and weight fractions used in Equations F-2, F-3, and F-4 of this subpart must be

measured in accordance with the recommendations of the EPA/IAI Protocol for Measurement of Tetrafluoromethane (CF₄) and Hexafluoroethane (C₂F₆) Emissions from Primary Aluminum Production (2008) (incorporated by reference, see § 98.7), except the minimum frequency of measurement shall be every 10 years unless a change occurs in the control algorithm that affects the mix of types of anode effects or the nature of the anode effect termination routine. Facilities which operate at less than 0.2 anode effect minutes per cell day or operate with less than 1.4mV anode effect overvoltage can use either smelter-specific slope coefficients or the technology specific default values in Table F-1 of this subpart.

(b) The minimum frequency of the measurement and analysis is annually except as follows:

(1) Monthly for anode effect minutes per cell day (or anode effect overvoltage and current efficiency).

(2) Monthly for aluminum production.

(3) Smelter-specific slope coefficients, overvoltage emission factors, and weight fractions according to paragraph (a) of this section.

(c) Sources may use either smelter-specific values from annual measurements of parameters needed to complete the equations in § 98.63 (e.g., sulfur, ash, and hydrogen contents) or the default values shown in Table F-2 of this subpart.

[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 79155, Dec. 17, 2010]

§ 98.65 Procedures for estimating missing data.

A complete record of all measured parameters used in the GHG emissions calculations is required. Therefore,